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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/680,898	10/08/2003	Zhijun Qu	IR-2378 (2-3	6326
2352	7590	05/13/2005	EXAMINER	
OSTROLENK FABER GERB & SOFFEN 1180 AVENUE OF THE AMERICAS NEW YORK, NY 100368403			MAI, ANH D	
			ART UNIT	PAPER NUMBER
			2814	
DATE MAILED: 05/13/2005				

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

10/680,898

Applicant(s)

QU, ZHIJUN

Examiner

Anh D. Mai

Art Unit

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 14 April 2005.  
2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.  
3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-16 is/are pending in the application.  
4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.  
5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.  
6) ☒ Claim(s) 1-16 is/are rejected.  
7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.  
8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.  
10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).  
11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
a) ☐ All b) ☐ Some \* c) ☐ None of:  
1. ☐ Certified copies of the priority documents have been received.  
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.  
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☐ Notice of References Cited (PTO-892)  
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)  
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_.  
4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_.  
5) ☐ Notice of Informal Patent Application (PTO-152)  
6) ☐ Other: \_\_\_\_\_.

## **DETAILED ACTION**

### ***Status of the Claims***

1. Amendment filed April 4, 2005 has been entered. Claims 1, 5, 9 and 13 have been amended. Claims 1-16 are pending.

### ***Claim Rejections - 35 USC § 112***

The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

2. Claims 1-16 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

There does not appear to be a written description of the claim limitation "each of said pylon having a substantially constant diameter" (amended claims 1,5 and 9) in the application as filed.

The specification is completely silent on the size of the pylons and does not indicated that that the drawing are drawn to scale.

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

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3. Claims 13-16 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Amended claim 13, line 4-7, recites: "respective source regions of said one conductivity extending into said body regions and defining regions in said body region and beneath said respective sources regions which are removed from the outer periphery of said pylon top".

The term is not understood, thus, the claims are indefinite.

### *Claim Rejections - 35 USC § 103*

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 1-16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Blanchard (U.S. Pub. No. 2003/0122188) of record.

With respect to claim 1, as best understood by the examiner, Blanchard teaches a superjunction semiconductor device as claimed including:

a semiconductor body (1) of a first conductivity type (n) and having parallel top and bottom surfaces;

a plurality of spaced pylons (40/42) of the other conductivity type (p) extending through at least a portion of the thickness of the body (1);

a plurality of MOS gated structures, each respective MOS gated structure (18) including a source region (7/8) disposed in a body region (5a) which is positioned above and in contact with one of the pylons (40/5b), each of the pylons (40/5b) having a substantially constant diameter, the major length of the pylons (40) extending from their ends which are closest to the bottom surface being in charge balance with the body (1) surrounding them;

the remaining length (5b) of each of the pylons (40/5b) at the top thereof having a higher concentration ( $p^+$ ) than that of the major length whereby avalanche current is at least partly directed toward the center of the top of the pylon and away from the region beneath the source. (See Fig. 3).

Regarding the plurality of MOS gated structures, although disclose one MOS gated structure (18), however, the semiconductor device of Blanchard includes multiple MOS gated structures. (See [0028]).

The remaining length (5b/6b) of Blanchard appears to be *substantially* same diameter to the rest of the pylons (40).

With respect to claim 5, as best understood by the examiner, Blanchard teaches a P type semiconductor pylon in an N type body for a superjunction device as claimed including:

the P type pylon (40/5b) having an increased concentration at its top end (5b/6b) which is greater ( $p^+$ ) than and overbalances the concentration of the surrounding N type body ( $n^-$ );

the remainder of the length of the pylon (5b) being in charge balance with the surrounding N type body (1), the pylon (40/5b) having a substantially constant diameter. (See Fig. 3).

The remaining length (5b) of Blanchard appears to be *substantially* same diameter to the rest of the pylons (40/5b).

With respect to claim 9, as best understood by the examiner, Blanchard teaches a superjunction device having avalanche capability as claimed including:

a semiconductor wafer body (1) of one conductivity type (n) and having a major electrode (D) on the bottom of the wafer;

a plurality of identical and spaced pylons (40/5b) of the other conductivity type (p) extending through at least a portion of the thickness of the wafer (1);

at least the lower portions (40) of the pylons (40/5b) being in charge balance with the wafer body (1); and

a portion (5b) of the top of the pylons having a greater charge ( $p^+$ ) than that (40) of the lower portions ( $p^-$ ), each of the pylons having a substantially constant diameter. (See Fig. 3).

The remaining length (5b/6b) of Blanchard appears to be *substantially* same diameter to the rest of the pylons (40).

With respect to claims 2, 6 and 10, the charge in the remaining length of Blanchard seems to be within the claimed range.

With respect to claims 3, 4, 7, 8, 11 and 12, remaining length of the pylons of Blanchard seems to be within the claimed range.

With respect to claim 13, as best understood by the examiner, the device of Blanchard further includes MOS gated structures (18) disposed at the top of each of pylons (40/5b);

the MOS gated structure (18) comprises a body region (5a) of opposite conductivity type (p) and which extends across and overlaps its respective pylon;

respective source regions (7/8) of the one conductivity (n) extending into the body regions and defining regions in the body region (5a) and beneath the respective sources regions which are removed from the outer periphery of the pylon top;

the gate structure (18) extending across respective invertible channel regions between the respective source regions (7/8) and the wafer body (1) at the top of the wafer body (1); and

a source electrode (12) extending over the top of the wafer body (1) and in contact with the respective source regions (7) and the body regions (5a). (See Fig. 3).

With respect to claim 14, the charge in the remaining length of Blanchard seems to be within the claimed range.

With respect to claims 15 and 16, remaining length of the pylons of Blanchard seems to be within the claimed range.

### ***Response to Arguments***

5. Applicant's arguments filed April 14, 2005 have been fully considered but they are not persuasive.

Applicant appears to contend that top portion 5b and 6b are not part of the "pylon".

However, insofar as the apparatus is concerned, portions 5b and 40 are parts of the diffusion structure since they are intimately contacting each other, thus they are one. Therefore, the limitation of the claim is met.

With respect to the diameter of the “pylon”, the instant specification fails to support the “constant diameter”. Further, the diameters of portions 5b and 40 of Blanchard can be seen as *substantially* the same.

### *Conclusion*

6. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Anh D. Mai whose telephone number is (571) 272-1710. The examiner can normally be reached on 9:00AM-5:00PM.

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wael Fahmy can be reached on (571) 272-1705. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



**ANH D. MAI**  
**PRIMARY EXAMINER**

May 10, 2005